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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

HEIN, GREGORY P

ART UNIT PAPER NUMBER

2188

DATE MAILED: 01/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/713,943		KIM ET AL.	
	Examiner		Art Unit	
	Gregory P. Hein		2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 5 - 15, 17, and 20 is/are rejected.
- 7) ☒ Claim(s) 2, 4, 16, 18 - 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>01/13/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The specification submitted on 11/14/2003 has been approved by the examiner.

Drawings

2. The drawings submitted on 11/14/2003 have been approved by the examiner.

Claim Objections

3. Claim 1 is objected to because of the following informalities: In claim 1, line 7 "...an free memory..." should be "... a free memory..."
4. Claim 7 is objected to because of the following informalities: Examiner believes that claim 7 was intended to depend from claim 6.
5. Claim 18 is objected to because of the following informalities: Line 3 status "... a second value..." Claim 17 does not introduce a first value as would be expected for a second value. Appropriate correction is required.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 14, 17, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,784,699 (McMahon).

8. As per claim 14, McMahon teaches:

(a) when n is a power of 2 and i is a positive integer, if the size of a requested memory space for allocation is greater than $\frac{n}{2^i}$ - bytes, allocating an $\frac{n}{2^{i-1}}$ - byte memory space to a valid entry existing in an $\frac{n}{2^{i-1}}$ - byte entry list managed by a free list memory (McMahon Col. 5 lines 35 – 39 The free list corresponding to the next larger bin size is searched when a particular memory size is unavailable. McMahon Col. 6 Table 1 Row entries 1 and 2 satisfy the size structure of the memory blocks.)

(b) if the size of a requested memory space for allocation is equal to or less than $\frac{n}{2^i}$, allocating an $\frac{n}{2^i}$ -byte memory space to a valid entry existing in an $\frac{n}{2^i}$ -byte entry list managed by the free list memory (McMahon Col. 3 lines 12 – 17), but if there is no valid entry in the $\frac{n}{2^i}$ -byte entry list, dividing the $\frac{n}{2^{i-1}}$ - byte entry list and allocating the divided $\frac{n}{2^{i-1}}$ -byte entry list as an $\frac{n}{2^i}$ -byte memory space (McMahon Col. 3 lines 54 – 58 If only one large block is available and the large available block can be divided into two smaller blocks satisfying the allocation request size, the large available block size is divided and allocated.

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McMahon Col. 6 Table 1 Row entries 1 and 2 satisfy the size structure of claim 14 limitations.)

As per claim 17, McMahon teaches:

(a) when n is a power of 2 and i is a positive integer, if the size of a de-allocated memory space is greater than $\frac{n}{2^i}$ - bytes, de-allocating an $\frac{n}{2^{i-1}}$ - byte memory space to a data memory and including an entry corresponding to the memory space in an $\frac{n}{2^{i-1}}$ - byte entry list managed by a free list memory

(McMahon Col. 10 lines 4 – 10); and

(b) if the size of a de-allocated memory space is equal to or less than $\frac{n}{2^i}$ - bytes, de-allocating a memory space of $\frac{n}{2^i}$ bytes to the data memory and including an entry corresponding to the memory space in an $\frac{n}{2^i}$ - byte entry list managed by the free list memory, but if a neighboring memory space managed by the entry which manages the de-allocated memory space is not in use, including an entry, which corresponds to a memory space obtained by combining the de-allocated memory space and the neighboring memory space, in the $\frac{n}{2^{i-1}}$ - byte entry list (McMahon Col. 8 lines 46 – 53 Additionally, McMahon Col. 6 Table 1 Row entry 1 and 2 satisfy the structure of the memory sizes.)

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 1 rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,784,699 (McMahon et al.) as applied to claim above, and further in view of U.S. Patent 6,892,284 (Ling et al.).

11. As per claim 1, McMahon teaches:

a data memory which comprises a plurality of data blocks, each of which comprises a plurality of sub data blocks having a predetermined size (McMahon Col. 2 line 65 – Col. 3 line 1 where the slots are equivalent to the plurality of data blocks in claim 1), and when there is a request for allocating memory space of a variable size, allocates memory space in units of any one of the sub data blocks and the data blocks (McMahon Col. 3 lines 9 - 12);

a free list memory which manages an free memory space of the data memory as at least one or more lists (McMahon Col. 3 lines 1 - 4);

McMahon does not teach the use of tail pointers except in the case of divided allocation blocks.

Ling teaches storing both head and tail information (Ling Col. 5 line 44 – 47 It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Ling with McMahon since the method of Ling when stored

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in separate memory leaves more space for in the partition for storing data Ling
Col. 5 line 29 – 31.)

As per claim 3, McMahon teaches:

The number of entries of the free list memory is the same as the number of entries of the data memory and the entries of the free list memory and the entries of the data memory have a 1:1 corresponding relationship (McMahon Col. 6 line 65 – Col. 7 line 2 Each free list has a mapping to each block that indicates the availability status of the block. Each block size has a free list making the mapping a bijection.)

As per claim 5, McMahon teaches:

The data memory has a hierarchical structure, in which the data memory contains a plurality of data blocks each having memory space of n bytes when n is a power of 2 and i and j are positive integers ($i < j$) (McMahon Col. 2 line 66 – Col. 3 line 1), and each data block comprises a plurality of sub data blocks each having a memory space of $\frac{n}{2^i}$ - bytes and each sub data block comprises a plurality of sub data blocks each having a memory space of $\frac{n}{2^j}$ - byte (McMahon Col. 6 Table 1 row entries 1 and 2 teach block sizes of 16 bytes and 32 bytes, respectively, thus satisfying the structure of claim 5 limitations.)

As per claim 6, McMahon teaches:

Each entry forming the free list memory comprises:

a plurality of bit masks each indicating whether or not a sub data block is in use (McMahon Col. 3 line 4 – 6 and McMahon Col. 6 line 65 – Col. 7 line 2 and

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Col. 7 lines 24 – 28 collectively describe a bijective mapping between bit masks and sub-data blocks indicating each blocks availability status); and

McMahon does not teach explicitly a pointer to the data block immediately after an selected entry (Ling Col. 5 lines 29 – 31 Each partition may include a pointer to the next partition or these pointers may be stored in a separate memory as a FIFO stack. It would have been obvious to one of ordinary skill in the art at the time of the invention since the pointers allow the partitions to be linked if there are more then Ling Col. 5 lines 25 – 27.)

As per claim 7, McMahon does not teach pointers to data blocks immediately before currently selected data blocks.

Ling teaches a pointer to data immediately before the currently selected data block (Ling Col. 5 lines 44 – 47 teaches a tail pointer.)

As per claim 8, McMahon teaches:

According to the bit mask value, the free list memory forms an n-byte entry list capable of allocating an n-byte memory space, an $\frac{n}{2^i}$ - byte entry list capable of allocating an $\frac{n}{2^i}$ - byte memory space, and an $\frac{n}{2^j}$ -byte entry list capable of allocating an $\frac{n}{2^j}$ -byte memory space (McMahon Col. 3 line 4 – 6 and McMahon Col. 6 line 65 – Col. 7 line 2 and Col. 7 lines 24 – 28 The bit map index and the group bit map index indicate the size of the data blocks via their association with a particular free list bit map and the group bit map index

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indicates the individual availability status. Combined this information indicates

the ability to allocate memory spaces of $\frac{n}{2^i}$ and $\frac{n}{2^j}$.)

As per claim 10, McMahon teaches:

When memory space of $\frac{n}{2^i}$ bytes is allocated, if there is no valid entry in the $\frac{n}{2^i}$ -byte entry list, the $\frac{n}{2^{i-1}}$ -byte entry list is divided and allocated as the $\frac{n}{2^i}$ -byte memory space (McMahon Col. 3 lines 54 – 58 McMahon Col. 6 Table 1 row entries 1 and 2 satisfy the structure of the data block size.)

As per claim 11, McMahon teaches:

When memory space of $\frac{n}{2^j}$ bytes is allocated, if there is no valid entry in the $\frac{n}{2^j}$ -byte entry list, the $\frac{n}{2^i}$ -byte entry list is divided and allocated as the $\frac{n}{2^j}$ -byte memory space (McMahon Col. 5 lines 35 – 39 and McMahon Col. 6 Table 1 row entries 1 and 2 satisfy the structure of the size of claim 11 limitations).

As per claim 12, McMahon teaches:

When the $\frac{n}{2^i}$ -byte memory space is de-allocated, if an $\frac{n}{2^i}$ -byte memory space neighboring the de-allocated memory space in the same entry is not in use, the de-allocated memory space and the neighboring memory space is combined and de-allocated as an $\frac{n}{2^{i-1}}$ -byte memory space (McMahon Col. 10 lines 4 – 18 Additionally, McMahon Col. 6 Table 1 Row Entries 1 and 2 satisfy the structure of claim 12 limitations.)

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As per claim 13, McMahon teaches:

The apparatus of claim 8, wherein when the $\frac{n}{2^j}$ - byte memory space is de-allocated, if an $\frac{n}{2^j}$ - byte memory space neighboring the de-allocated memory space in the same entry is not in use, the de-allocated memory space and the neighboring memory space are combined and de-allocated as an $\frac{n}{2^i}$ - byte memory space (McMahon Col. 11 lines 13 – 18 When a large memory block is divided the smaller blocks are remerged during the de-allocation process via double linked pointers. McMahon Col. 6 Table 1 Row entries 1 and 2 satisfy the size structure of the memory blocks.)

As per claim 15, McMahon teaches:

(a-1) allocating an entry corresponding to the head location of the $\frac{n}{2^{i-1}}$ byte entry list as the memory space, and setting a bit mask corresponding to the memory space to a first value which indicates that the entry is currently in use (McMahon Col. 7 lines 1 – 2 and lines 24 – 28 The master bit map index and the group bit map index combined provide a fast searching method that indicates the availability of every memory block as grouped by block size. It is inherent to the system that upon allocating or de-allocating a memory block the corresponding master bit map index, when appropriate, and group bit map index would be updated to reflect the new block status. McMahon Col. 6 Table 1 Row entries 1 and 2 satisfy the size structure of the memory blocks.); and

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(a-2) updating the head location value of the $\frac{n}{2^{i-1}}$ - byte entry list with the location value of a next entry in the same entry list (Ling Col. 6 lines 17 – 26 The free pool pointer points to the top of the stack which contains the block addresses available for allocation. As blocks are allocated the pointer is updated as pop calls are made to the stack to retrieve addresses. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Ling with McMahon since the pointer to the head of the stack allows the free blocks to be located during an allocation Ling Col. 6 lines 8 – 11.)

Allowable Subject Matter

12. Claims 2, 4, 9, 16, 18, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. Claim 20 would be allowable if rewritten to depend from claim 16, 18, and 19 only.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory P. Hein whose telephone number is 571-272-4180. The examiner can normally be reached on M-F 8-4:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mano Padmanabhan can be reached on 571-272-4210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gregory Hein
12/16/2005

Handwritten signature of Mano Padmanabhan in black ink, with the date 12/22/05 written below it.

MANO PADMANABHAN
SUPERVISORY PATENT EXAMINER